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CIA/RR GS 65-18  
September 1965

Intelligence Factors Bearing on Bloc Interest in US Gravity Meters

for

INTELLIGENCE STATEMENT FOR 1965 COMINT LIST REVIEW

1. The relative capabilities of the United States and the Soviet Union in respect to the construction of gravity meters remain essentially the same as a year ago. The United States is believed to retain superiority in the manufacture of gravity measuring instruments, although Soviet instruments seem to be adequate for prospecting and geodetic gravity determinations within the Bloc.
2. Efforts are continuing in both countries to improve the accuracy of existing gravity meters, to increase their stability in operation, and to broaden the manner of their use. Much research is devoted to adapting the gravity meter to use on surface vessels and in airplanes. Complications arise in attempting to compensate for accelerations of the platform carrying the meter. The motions peculiar to a ship rolling in the sea or an airplane undergoing sudden small changes in flight direction theoretically average out after an appropriate lapse of time. In practice, however, the determination of the proper time interval of compensation is difficult both to ascertain and to apply to a continuous recording of gravity values. Computer methods for processing the data constitute an important part of the problem.
3. Results attained by the United States thus far give gravity values believed to be correct to within about 10 milligals for airborne meters and possibly 5 to 6 milligals for seaborne instruments. These results have to be further downgraded owing to navigational uncertainties as to the position of the vehicle corresponding to a determined gravity value. The United States hopes within a few years to reduce to several milligals of uncertainty seaborne gravity determinations made on surface ships in moderate seas. Airborne gravity meters will make possible the investigation of the exterior gravity field of the earth even though values along a flight path may ultimately be 5 to 10 milligals in error.
4. A Soviet patent was granted in 1960 to Ye. I. Popov and Yu. D. Bulychev for a device to measure gravitational acceleration from the aircraft. The patent description indicates a strongly damped sensitive quartz system which permits continuous observation and automatic recording of average gravity values during the flight of an airplane. The sensitive

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quartz system is immersed in a viscous silicone oil which provides means for damping as well as improvement of control over the temperature of the system. Accuracies of about 10 milligals are claimed in the patent description. This invention appears to be an outgrowth of ideas cultivated from the general literature on gravity meters, with innovations contributed by the inventors. Apparently the USSR is alert to the possibility of significant new developments in the United States and is trying out many novel ideas in the hope of creating a superior instrument.

5. Although Soviet attempts to secure US gravity meters have been less in evidence during the past year than in the preceding year, the USSR would still undoubtedly welcome the acquisition of additional US gravity meters. On the other hand, pride in its own accomplishments in the construction of gravity meters could well lead to a self-deceiving attitude toward the sufficiency of Soviet apparatus and therefore to a lessening of apparent interest in gravity meters made in the United States. The design, construction, and assembly of gravity meters is an art in the field of instrumentation in which there are few qualified workers. Tricks-of-the-trade in manufacture and assembly are jealously guarded by the few who know them and are not revealed in scientific and patent literature. The disassembly of a gravity meter made in the United States is still probably the best practical way the USSR has to obtain fresh ideas for improving their own meters.

6. At present the manufacture of gravity meters in the United States is confined to about a half dozen companies. In the main, pride in workmanship and satisfaction with ultimate performance take precedence over the profit motive in curtailing the expansion of the industry. Individual meters are quite high in price, and the costs of new development are so great that only a few well-established companies can operate successfully within the limited domestic market. Incentives to expand into the foreign market are present, and many gravity meters made in the United States are now used in Europe and throughout the world. It is unlikely, however, that any US company would sell its product to a Bloc nation if requested not to do so to maintain the security interests of the United States.

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